operator intervention. In the short term, broadcasters may choose to operate their facilities with a single format. In the long term, coping with multiple formats will be automated. Note that this assumes studios will eventually be equipped with suitably designed equipment that does not have the same limitations as analog equipment.

3. *Will there be any provision for multiplexed 525 line pictures?*

There are no plans for multiplexing 525-line pictures, although the data stream used in the system has a channel capacity that could be diverted in whole or in part to other services besides HDTV. Multiplexed 525-line television is not within the scope of the FCC's mandate for the Advisory Committee or for HDTV proponents.

4. *Why isn't digital 525 among formats proposed? There is every reason to believe that digital 525 and likely wide-screen versions will be widely deployed in consumer market, driven by cable/satellite signal delivery, by the time that HD arrives in the market.*

See answer to Question 3, immediately preceding, and Question 1 in this section.

5. *Scanning formats are listed at temporal rates of 24, 30 and 60 Hz. What accommodation is made for 59.94 Hz and 29.94 Hz field and frame rates?*

The listed 60 Hz frame rate is intended to represent either or both of the 60.0 Hz and 59.94 Hz frame rates. The GA understands that good reasons have been advanced for both of these frame rates, and a decision on whether one or both should be supported is under consideration. This is primarily a production standards issue.

ROLE OF 1050 (960-ACTIVE) INTERLACED FORMAT

1. *If Proponents expect to phase out 1050I "in the near future", will they do interlace design properly?*

The GA plans to incorporate an interlaced-scan capability in its system that provides full HDTV image quality. The GA supports a change to progressive scanning as soon as feasible because it recognizes the long-term advantages of progressive scanning in terms of interoperability and absence of certain interlace artifacts.

2. *Why do GA members presume that the 1050 line interlace format will be phased out? How has their presumption affected the system specification? What evidence is there to back up the Alliance's preferences, recommendations, and mandates in this proposal?*

The standard established by the FCC will determine what formats are included in the future television infrastructure. Since there is substantial decoupling of the source, transmission and display for digitized television, a change to the higher line number progressive scan can be made when it is feasible. This change would allow a continuation of multiple formats to be handled within television production plants, and such a change could be anticipated in the receivers, which will in any event need to have format conversions for NTSC and efficiently compressed film modes.

24/30 FPS FILM ISSUES

1. *Explain benefits of film P scan TX modes: 1) For 1050 formats either I or P scan could capture the same information from film frame for TX. What is the advantage of P scan TX? 2) As source offering high spatial resolution, why would film rendition with 787 resolution be chosen over 1050?*

Since film images are captured at a single epoch, they are most naturally represented in progressive scan formats, where the entire frame is scanned in a single pass. This allows for a presentation of the same information in a single pass at the receiver display, which is a good approximation to the single-epoch image capture of film. The compression of the scanned film images needs to code the intact frames, for efficiency as well as to avoid introduction of interlace artifacts. The progressive mode specifically eliminates the need to code TV frames that are composed of two successive film frames. The compression is indifferent to whether the intact frames were disassembled during capture and interlaced, as long as they are reassembled and presented for coding as progressively scanned frames.

The 720-line formats for film, with lesser resolution, are dominated in potential quality by the 960-line film modes that are also progressively scanned. However, as indicated by the testing of prototypes in 1992, the 720-line format produces excellent quality images at a viewing distance of three picture heights, and that quality can be transmitted to viewers with fewer bits per second than would be needed for the 960-line film modes that have potentially more resolution. If a broadcaster were to decide that the 720-line film mode would provide perceptually excellent HDTV images that were adequate for the given application, a portion of the channel capacity could then be made available for alternate services. For some movies, the rate-distortion characteristic of the compression algorithm may indicate a better match between the 720-line compression and the image content than between the 960-line compression and the image content.

2. *Does TX of 24 and 30 frames per second film material result in increased cost for receivers? Is more memory required in the receiver? If there is a cost increase, how significant?*

The cost of accommodating the film modes within the receiver can be subsumed in the receiver buffer management and buffer memory needed for decompression. These elements will be sized to handle the largest image maps anticipated by the receiver manufacturer for a particular receiver design, and conversions from NTSC and other formats will doubtless be built in to allow display on a receiver's common "native-mode" display format.

3. *Why isn't greater advantage taken of film oriented programming? Lower frame rates for film would certainly admit higher resolutions. A telecine capable of 1080 x 1920 x 24 has been demonstrated and could be commercially available soon.*

The formats listed include higher spatial resolution for film modes than any tested in the 1992 testing of prototypes. There would be additional cost for the receiver frame memories if a larger size pixel map were specified for film modes.

4. *How would film material transmitted at 24 or 30 frames per second be displayed?*

The receiver will display film at a 60 Hz refresh rate using a pull-down and temporal filtering algorithm appropriate to its (the receiver's) display. The display mode will be a receiver manufacturer implementation issue.

5. *What is the GA definition of film material? Is filmed material that is recorded on video tape still film material? Is filmed material recorded and edited with material from other sources still film material?*

Film material can be defined as sequences of images in which all of each image is created or captured at one instant. The compression coding process can optimize performance by internally dealing directly with the original input format. As a practical matter, the GA encoders can take advantage of the lower intrinsic pixel rates when presented with 24 Hz or 30 Hz film material, whether the input is presented at 60 Hz using a pull-down technique, or at the original 24 Hz or 30 Hz frame rate; the GA coding algorithms can detect the intrinsic rate and code the sequences accordingly. If insertions or overlays disrupt the lesser film rates, then sequences would be coded as 60 Hz video. There is no conceptual impediment to intermixing of such frames.

6. *Telecines capture video image in P manner but later transform this to 59.94 Hz I video format. Carrying 3:2 pull down ident with video perfect 24 frames per second P video can be restructured. Has ident?*

Question not completely understood. See answer to Question 5 immediately above. The GA system will have the ability to automatically detect and take advantage of the redundancy inherent in film modes, in a "source-adaptive" fashion. See the answer to the immediately preceding question.

7. *Will there be cross-conversion of 16:9 and 4:3 programs during simulcast years. Have implications of down-converting 24 frames per second P to 525I been examined? Have implications of up-converting 525/59.94 movie originated material to ATV at 24 frames per second P scan been examined?*

Yes, conversions from progressive formats to 525-line interlaced formats have been considered, and they are relatively easy to implement and will be cost-effective. The source-adaptive coding allows up-converting of NTSC-rendered film material that takes advantage of the image sequence redundancy. See the answer to Question 6 immediately above.

8. *Are HDTV telecines expected - from outset - to incorporate 1050/1:1/24/30 and 787/1:1/24/30 switchable capability? Have technical and cost implications been considered?*

The capability for switching among formats will not be required, but would be a choice for manufacturers of telecine equipment. In a digital video environment, the manufacturers of telecines may choose to make the video outputs self-identifying, which could lead to simplification in the production plant. In the future, editing and switching functions could be programmable and automated, and the cost of supporting multiple formats would therefore be inconsequential.

9. *Are VTR's operating at 24 frames per second envisaged for direct input to the encoder?*

As studio production equipment evolves, the recording of film-rate material at the native rate may become attractive. The reason is that the source-adaptive coding eliminates the need for introducing a 60 Hz representation that would then be coded at the lesser rate before transmission. Such recorders may operate with uncompressed video or video compressed using a higher bit rate studio compression algorithm, or using the broadcast HDTV compressed signal.

SQUARE VERSUS NON-SQUARE PIXEL ISSUES

1. *How are pixels arranged to create square pixels in interlaced system? 810 V x 1440 H? Will square pixels be required, or will resolution of 1050/2:1/60 system be 960 V x 1440 H, or something else? Are receivers to support all these arrangements (also I and P scan)?*

   See the answer to Question 1 of Section B. Receivers can be designed to automatically identify the format of a received signal and convert that format to the native mode display format of the receiver. Such conversions would be necessary in any event if NTSC formats are to be displayed in the same receiver, so the (negligible but non-zero) burden of providing format flexibility will be included in practical, marketable HDTV receivers. Therefore, the GA anticipates that receiver manufacturers will be required to support all of the FCC-approved transmit formats.

2. *Assuming 960 active lines in 1050 system-around 1706 H samples required to implement square pixel sampling lattice. This is higher than implemented so far. Is there technical foundation to suggest that 1706 x 960 could be implemented at launch of ATV service?*

   Compression algorithm experiments indicate that the coding used for the 960-line by 1728 samples interlaced format will introduce a sufficiently small number of artifacts for acceptable HDTV broadcasting, for most image sequences. Recent MPEG-2 results indicate significant improvements over MPEG-1 coding used in the ADTV system, for example.

3. *If 1706 x 960 cannot be implemented in early days of ATV, what "lower H resolutions" sampling structures are planned? Will this be single number or a possible hierarchy to allow step-by-step evolution over time (as technology steadily improves)?*

   The interlaced 960-line format includes a variation with 1408 pixels per line. There would be no technical impediment to specifying other variations, but the benefit of decreasing the granularity of such a horizontal sampling hierarchy would need to be weighed against the cost to pre-condition HDTV receivers to anticipate those different pixel counts and to re-format them appropriately.

4. *In the event that lower H sampling is necessary (in early days) for 1050 system (thus precluding square pixel), has degree of non-interoperability with computers been given serious study?*

   Yes, the interoperability with computers has been considered carefully. The fact is that interoperability with computers is not a binary event; there are degrees of interoperability, depending on the application. The existence of some broadcast

material in interlaced form is not a cataclysm, but means that for interlaced material, interoperability will involve less perfect and less convenient conversions.

5. *What are the number of pixels H and V used in the various 1050 and 787 line modes? What are "lower H resolutions" referred to in technical description document? Since these would necessarily have non-square pixels, what is the effect on interoperability with computers?*

See the answer to Question 2 in the section on Implications of Multiple Formats, and Question 4 in the current section.

6. *What is meant by "lower horizontal resolutions"? Explain the relationship between these lower H resolution formats and square pixels. What effect will these formats have on the goal of achieving interoperability with computers? Furnish a table of H and V pixels for all formats.*

Lower horizontal resolution means the horizontal spacing between successive picture elements is larger. If the horizontal spacing is larger (or smaller) than the vertical spacing between adjacent lines, the pixels are said to be "not square." Conversions for computer applications, such as insertion in a computer window, would involve spatial filtering to correct the pixel aspect ratio. This is not considered a major impediment, since the computer or work-station will probably be processing the image sequence anyway to adjust the frame rates and to create the windowed raster. See the answer for Question 4 in this section.

7. *What are the purposes of lower H resolution? For softer images or will it be combined with lower V resolution to permit small pictures? If latter, will data suggest whether image be scaled up or not? Should we evaluate such for Broadcast? Will it increase receiver complexity?*

The lower horizontal resolution provides a sequence of pixel maps with fewer pixels per second, thereby easing the processing burden on the compression algorithm, leading to a final image with fewer compression artifacts. Depending on the picture content, the resulting reduction in artifacts may be perceptually significant. The vertical resolution will be the same for both the square-pixel and lower horizontal resolution variations.

8. *If lower H resolutions (and consequently non-square pixel operation) ARE allowed, has GA given serious consideration to 1080 line-based ATV TX scanning structure at outset? Have merits of such an approach (from a total broadcast system viewpoint) been considered?*

The GA has given serious consideration to the 1080-line formats, and we recognize the merits of that format. There are countervailing disadvantages for the 1080-line

format that also were considered, such as the increased cost for larger frame memories in receivers, and the current inability to compress the 60 Hz 1080-line format with square pixels. See the "white paper" from the GA on this subject.

RECEIVER ISSUES

1. *Estimate the increased complexity and manufacturing cost for encoders and receivers to support the six scanning formats.*

   Given a receiver architecture that includes display conversion for NTSC, the incremental cost of supporting the multiplicity of formats is negligible. This is so because the other formats can be considered sub-sets of the most demanding formats, requiring mainly a flexible conversion capability for display in the receiver's native display mode. The decoder in every case will load a frame memory with image data in the format received from the transmission channel. That mode need not be identical to, and in the case of NTSC derived from an analog or digital tuner, cannot be identical to the receiver's display format.

2. *To accommodate various TX formats, most likely design approach for receiver manufacturers: changing display scanning rate at receiver or transcoding TXed data stream in receiver to single display scanning format? What single display scanning format most likely? Cost/benefits?*

   It seems unlikely that receivers will be built with multi-sync capabilities, so that a single display mode will probably exist in any particular receiver. The choice of display format should be a receiver manufacturer option, with a range of possibilities. For high-end receivers, a high-line-number progressive scan may be used for best possible pictures with minimum artifacts (especially for progressive scan movies, e.g.).

3. *Be agreeing on a progressive display mode for large screen sets, is the GA proposing that receiver standards should be incorporated in the FCC transmission standard?*

   No. However, the GA believes that the HDTV standard should include some element that pro-actively supports the early migration to progressive scanning in the transmission channel. Various mechanisms for influencing the process toward that goal are under consideration.

4. *From the perspective of interoperability and compatibility with all program delivery mechanisms, will the ATV receiver be capable of decoding and displaying other formats such as NTSC and 525-line component wide screen formats?*

The HDTV standard under consideration does not embrace NTSC (except in its spectrum compatibility requirements) or digital 525-line systems. As indicated in the answer to Question 1 in the section (C.) on 525/59.94 issues), the GA system is conceived as an HDTV system only. The channel capacity of the terrestrial broadcast transmission sub-system can support arbitrary digital services that are beyond the purview of the GA. See also the answers to Questions 3 and 4 in the same section.

5. *What consideration is being given to ensure interoperability with all delivery media, multimedia services, computers and other complimentary consumer products?*

The digital representation provides the most important capability for interoperability with the named products and services. Use of packetized transport with carefully specified headers and descriptors allows data streams to be self-identifying. The incorporation of progressive scanning where possible (i.e., in all but one of the supported scanning formats) facilitates format conversions that will be incidental to many interconnections among television applications. Similarly, the use of square pixels is consistent with the need to be compatible with computer graphics applications.

6. *Will the ATV receiver include the capability to decode and display NTSC?*

The ability to decode and display NTSC should be a receiver option, driven by marketplace forces. See the answers to Question 1 in this section, as well as to Question 16 in Section B, Question 2 in Section D, and Question 2 in Section E.

7. *Have the cost implications of including "multiple format" capabilities in the consumer television receiver been considered?*

Yes, the cost implications of handling multiple formats in the receiver have been considered. See the answer to Question 2 of Section E, and the answer to Question 3 in Section F.

8. (No Question 8 provided.)

9. *Describe the relationship of TX system plans to current and future display technologies.*

The departure from an analog television system affords the opportunity to at least partially decouple the display formats from the transmitted formats. In fact, that is

one of the great virtues of such systems, in that the display can be optimized somewhat independently of the format of the signal received from the transmission channel. The transmission formats have been chosen to allow easy conversions to display formats that can be handled affordably.

10. *How will a display device operate in the six format environment proposed (a block diagram is required).*

As indicated in the answer to Question 1 in this section, the GA anticipates any given receiver will have a common "native-mode" display format. Whatever image formats are decoded after reception from the channel will then be mapped into the receiver's display format. That operation can be as simple or as complex as the receiver manufacturer determines is appropriate for the given receiver application. If an interlaced image is received, the processing for display may include high-quality de-interlacing for more expensive receivers, and lesser-quality (less costly) de-interlacing for low-end receivers. See the block diagram appended.

11. *Seems all receivers must support all options. What is anticipated additional receiver cost to decode all possible options?*

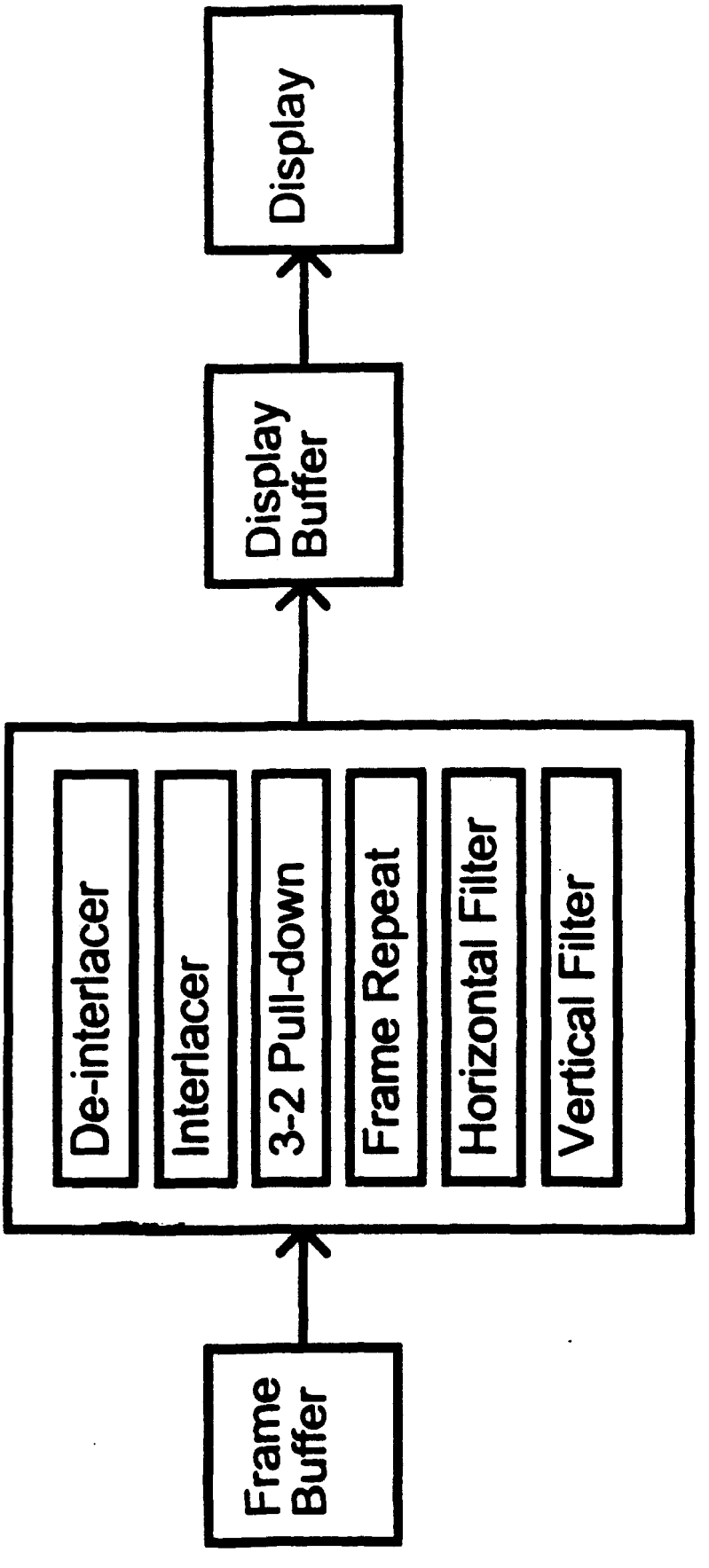
See the answer to Question 7 in this section.

12. *Is the progressively scanned mode for displays to be a requirement or a recommendation? Recommend marketplace choice as better.*

See the answer to Question 3 in this section. The GA supports the principle of marketplace choice, but believes a migration to progressive scan in the transmission path is in the public interest.

13. *Will early receivers become unusable after the migration?*

No, early receivers will not become obsolete after a migration to a higher line number format. Avoiding obsolescence of early receivers will be a prerequisite for the migration strategy, and receivers will be designed with appropriate "hooks" for migration. For example, receiver decoders and frame memories could be sized to handle the largest anticipated image maps, and to re-format a wide range of potential formats, perhaps even among formats that are self-defining. As an example of extensibility, one could design a receiver so that, when a previously unknown format identifies itself, the receiver display formatter could automatically invoke a default spatial filtering that converts from the new format to the display format.



HDTV Re-formatter for Display

14. *What conversion algorithms do you plan to use in a receiver to convert 24/30 Hz of film mode to 60 Hz? Do you think 2-3 pull-down can provide sufficient motion rendition for HDTV? If no, what is the conversion algorithm, and what will be the impact on receiver cost?*

The conversion for 30 Hz film mode seems trivial, especially for a progressive scan display mode. For the 24 Hz film mode, 3-2 pull-down will probably be most attractive because of its simplicity and long history of acceptance. One can conceive of temporal processing that would remove the "judder" associated with the time distortion inherent in 3-2 pulldown, but the algorithms to perform such processing would introduce artifacts of their own, and good performance would be costly.

15. *What is the impact on the receiver cost if your system supports various kinds of scanning format?*

See once again the answer to Question 7 in this section.

16. *Will all receivers be required to display all formats (by switchable scans or digital conversion at the receiver?)*

Yes. All receivers will be required to receive all defined transmission formats. The mechanism will most likely be by conversion of formats rather than by switching the receiver's display scanning format. If multi-sync displays are used, they will most likely be in workstations and personal computers, where there is already a market for displays that change formats (with substantial cost increase).

17. *How will multiple format approach be implemented from point of view of both receivers and program delivery? Will all receivers be able to decode and display all formats? If not, how would program format delivery choices be implemented?*

All receivers will decode all of the supported formats in the GA system. Since the cost of accommodating all the formats is expected to be negligible (although non-zero), we believe receivers will be designed with a flexible architecture. This will be particularly so once markets develop for alternate image services (such as multimedia services) that may benefit from matching formats to applications.

Program providers will be able to choose a transmission format that is most suitable for each application, with confidence that each receiver will display the images appropriately.

18. *How does GA expect to deal with various TX formats at receiver? Do they intend to change display scanning rate at receiver or transcode transmitted data to single common display scanning format? What are the advantages and disadvantages of either approach?*

See the answer to Question 16 in this section, as well as the answer to Question 7 of this section.

19. *CRTs likely to play a major role in early days of ATV service. P scan at high line rates implies new scanning coil designs and higher scanning power. Both will add cost to ATV receiver. Has this been considered?*

Yes.

20. *"Agreement" by GA members that large-screen HDTV receivers will incorporate progressive capability implies mandate within eventual FCC ATV TX standard. Appears to fly in face of precedent. Have technical and cost implications of such mandate been studied?*

See the answers to Questions 3 and 12 in this section.

21. *P scan has only been incorporated in modest sized computer displays. Has not been implemented in most large screen TV sets. Consumer choice seems imperiled. Have implications been considered? Doesn't this impede successful launch of ATV service?*

See the answer to Question 3 in this section. In general, consumer choice is enhanced by the GA approach to formats, since the proposed system allows at least partial independence of the choices for format in the capture and production environment, for transmission, and for display. This provision for choice of display format in particular makes it possible to optimize the viewing experience for widely different applications (consider movies, sitcoms, artistic documentaries, text and computer graphics, picture telephone applications, low-resolution video games) and stems primarily from the digital representation of signals, but also from a harmonious selection of formats.

We believe the high-end, larger screen sizes will in the long run best display images in a progressive format.

22. *Handling multiple scanning formats in ATV receiver - has GA come to conclusion regarding relative merits of multi-scan receiver system or single-scan system with appropriate prior image scanning format conversion? If so, what specific criteria led to such a recommendation?*

The GA does not believe multi-scan receivers will be used in consumer television. They may find application for workstations. See the answer to Question 16 in this section.

PRODUCTION FORMAT

1. *What do you expect will be the production format(s)?*

The GA believes that the production environment will include, as a practical matter, a variety of formats, both progressive-scan and interlaced. Because of the relative simplicity of scan conversions among well-chosen formats, the ATSC proposed production standard using 1080 by 1920 samples (interlaced initially) has one of the most important formats. Initial use of the 1035 by 1920 format in the SMPTE 240M standard has been demonstrated to be convertible to the 720-line and 960-line formats, during the 1992 testing of prototypes. The GA anticipates that within a given production studio, a single studio format will prevail, and film, camera and other video information will be converted to that native studio format for production. The broadcaster will then transmit the resulting program in whatever transmission format is most appropriate, with the flexibility (eventually) of dynamically changing transmission formats if that would be useful.

2. *Is there a reason 1080 x 1920 x 1:1 x 60 should not be the target for the ATV broadcasting service?*

No. For television production, there is no reason not to take advantage of the work in the ATSC T4 Task Force on Production Formats, which has focused on a 1080 by 1920 pixel format with progressive scanning at 60 Hz for the long-term goal. The interim proposal of a 1080 by 1920 pixel interlaced standard is also consistent with the GA compression and transmission system.

3. *Do you have any recommendations for a production format? How do you handle the 1080 x 1920 x 60/1:1 format when the 1050 line progressive format becomes your major input signal?*

See the answer above to Questions 1 and 2 in this section. Conversions from the 1080-line progressive format to both 720-line progressive formats and 960-line progressive formats will be easier to implement and of higher quality than the conversion used for testing of the HDTV prototypes in 1992.

4. *Does GA envisage multiple formats for HDTV production system (such as 1920 x 1080 and 1280 x 720)? If so, has [sic] very significant cost and technical implications been studied?*

Yes, the GA believes multiple formats will be useful for production (consider the desirability of not using an intermediate and unnecessary interlaced format in processing film for transmission). Within a given studio, a single production format will doubtless prevail. See the answer to Question 1 in this section. The cost and technical implications for accommodating multiple formats would only be unacceptable for a poorly designed production system that does not take advantage of the opportunities for flexibility that are inherent in digital systems.

5. *If high spatial resolution HDTV production system (such as 1920 x 1080) becomes origination format of choice, will GA incorporate scanning format and data rate transformation within ATV encoder?*

No, the boundary between the production format and the encoder should be a clean interface. This means that a conversion is implied between whatever production format is used in the studio and the transmission format chosen by the broadcaster.

The encoder for the transmission system will process the input video (including pre-processing such as spatial filtering) in the selected transmission format in order to optimize the performance of the compression.

TS-011

Docket 87-268

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RICHARD E. WILEY
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July 23, 1993

Dear Technical Subgroup Members
and Participants:

Following the June 30/July 1 meeting, I have talked extensively with Subgroup Co-chair Joe Flaherty and Bob Rast of the Grand Alliance and given further thought as to how we should proceed in the months ahead. My recommendations concerning a future course of action are set forth in this letter.

Initially, our plan was to recommend that the Advisory Committee give the Grand Alliance authority to build its prototype system shortly after our August 11 meeting. However, given the Expert Groups that have been appointed and the very important work they are performing, and given the "critical path" schedule that the Grand Alliance is following, I think a more intelligent approach would be to hold a series of Technical Subgroup meetings designed to review and, hopefully, recommend approval of various elements of the Grand Alliance system consistent with its schedule. To be specific,

(a) On August 11, I anticipate that we will review the progress that has been made to date by the Expert Groups and the Grand Alliance. In particular, the Subgroup can discuss the system specifications that will have been submitted by the Grand Alliance on August 5. I also hope that, on August 11, we can firm up the Alliance's developmental schedule.

(b) On or about September 14, I would hope that we will hold another meeting designed to review and perhaps recommend approval of the Grand Alliance's final Audio, Transport and Format/scanning specifications; and

(c) At a later meeting in the fall, we will review and perhaps recommend approval of the Grand Alliance's specifications for transmission and also system interoperability.

In other words, what I am proposing is that the Technical Subgroup (and its Expert Groups) will work with the Grand Alliance in a staged review and approval process, in accordance with the Alliance's own schedule. Moreover, at each segment of the process, and at each of the Technical Subgroup's meetings, we can continue to receive the input of interested members of the public (in particular, informed participants in the Advisory Committee process who are not members of the Subgroup). I believe that this would be a more effective way to proceed, one that will insure that any authorization to the Grand Alliance to construct its system is fully informed.

Incidentally, in addition to the Expert Groups appointed at the June 30/July 1 meeting, Joe Flaherty, Bob Rast and I have agreed that we also need further insight into the interoperability issue. Accordingly, we have decided to create a Joint Expert Group on this issue working with the Scanning Format and Compression Expert Group and the Transport Expert Group (chaired, respectively, by Bob Hopkins and Craig Tanner). Bob Sanderson has been asked to chair this Joint Expert Group which also will be staffed by Messrs. Gerovac, Haley, and others.

I hope and trust that you will agree with the approach suggested in this letter. We will have an opportunity to exchange views on this matter on August 11. Until then, please accept my best personal regards.

Sincerely yours,

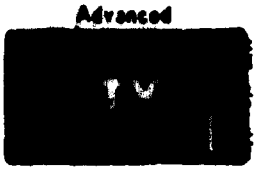
Dick

Richard E. Wiley

REW/eth
cc: Technical Subgroup Co-Chairs
Flaherty and Dorros
Grand Alliance Members

Docket 87-268

TS-012



Advisory Committee on Advanced Television (ATV) Service

Doc. No. _____

Date _____

Dear Expert Group Chairmen, July 26, 1993

Further to our letter of July 20, 1993, I have attached a copy of the augmented Experts Group Membership list which includes the new Joint Experts Group on Interoperability with the initial membership which will be expanded within the next week or two.

In addition, I have attached the mailing list of the Technical Subgroup, including the Ex officio members named by the EBU.

These lists will be updated from time-to-time for your information.

Finally, in order to make our documents available to interested parties, please send copies of all your minutes, input documents, etc. to Mr. Robert Bromery. His address is:

Mr. Robert Bromery
Deputy Chief
Authorization & Evaluation Division
Office of Science & Technology
Federal Communications Commission
2025 M Street N.W.
Room 7118
Washington D.C. 20554

He will make the documents available through the International Transcription Service as other ACATS documents are distributed.

Thanks,

I. Dorros

Dr. Irwin Dorros
Co-chairman
ACATS Technical Subgroup

J. A. Flaherty

Dr. J. A. Flaherty
Co-chairman
ACATS Technical Subgroup

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July 15, 1993

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[other members to be named]

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